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EVALUATING FRAMEWORKS FOR INNOVATION CAPABILITY IN SMEs: STRATEGIC AND SUSTAINABILITY IMPLICATIONS

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Abstract: This study provides a literature-based synthesis of the established framework for measuring and guiding innovation capability in small and medium-sized enterprises (SMEs) — including the Oslo Manual, the European Innovation Scoreboard, and SR 13547-4. Based on these references, we extract practical methods (such as innovation audit, open innovation, design thinking/TRIZ method, and leveraging public funding programs) and correlate them with sustainability objectives. A simplified benchmarking analysis using EIS 2024 places Romania at 0.34 of the EU average ($EU = 1$), with relatively strong digitization but a persistent deficit in terms of innovation outcomes and organizational innovation capability. We translate these quantitative and qualitative findings into prioritized and actionable recommendations for managers and policymakers.

Keywords: Innovation Capability; Management Innovation; Sustainable Development; SMEs; Digital Transformation.

1. INTRODUCTION

In the context of the SIM 2025 theme, “Optimizing the Future: Management Innovation for a Sustainable World”, innovation capability emerges as a decisive factor for ensuring long-term competitiveness and sustainable growth. Small and medium-sized enterprises (SMEs), as key drivers of economic development and job creation, must not only generate novel ideas but also transform them into market-ready solutions through effective resource utilization and collaborative networks. This dual focus—on creativity and implementation—aligns directly with the need for resilient, innovation-driven ecosystems that support sustainable development objectives.

By linking theory with case-based evidence from Romania and other European contexts, the study identifies actionable strategies for strengthening innovation capability at organizational, regional, and national levels.

These strategies are designed to increase competitiveness and to contribute meaningfully to sustainability goals. To evaluate innovation capabilities, it is important to emphasize the pivotal significance of innovation as a fundamental component of economic advancement, particularly regarding the contributions of small and medium-sized firms to this development.

Innovation capability refers to an organization's capacity to convert innovative ideas into viable solutions by using resources and fostering an internal climate that promotes change. This entails not only the generation of novel concepts but also the proficient execution of these ideas to generate value and ensure sustained long-term performance [1]. According to Schumpeter, innovation constitutes “creative destruction” that alters markets and economies [2].

Despite their substantial role in job creation and economic development, SMEs encounter

considerable obstacles associated with limited resources and constrained access to financing [3]. Henry Chesbrough emphasizes the need of open innovation, where companies work with outside partners to improve their ability to come up with new ideas. Chesbrough has shown that cooperating with outside partners may be quite helpful, such as giving you access to new information and technology [4,5]. These methods show that developing innovation skills is not something you can accomplish on your own; it's a systematic process that requires working with others and being open to new ideas. In this context, innovation aptitude is a critical factor influencing the competitiveness and longevity of firms, especially in an always developing global market. Innovation includes not just making new products or services, but also improving procedures, using new technology, coming up with new business models, and creating an environment in the workplace that encourages change [6–8].

Drucker looked at how important innovation is for management and entrepreneurship. He said that innovation is "a central function of entrepreneurship" and that it is necessary for long-term competitiveness. He stressed the need of strong leadership and a clear plan, which are both essential for any firm to successfully adopt new ideas [9]. Peter Drucker stressed the importance of leadership, while Clayton Christensen introduced the concept of "disruptive innovation," demonstrating its capacity to transform markets and empower SMEs to rival bigger firms through the utilization of emerging technologies [10]. Further study demonstrates that SMEs using digital technology can increase their innovation capability by up to 30% [11].

Building on these theoretical foundations, the focus shifts from understanding the drivers of innovation to examining how organizations can systematically assess and strengthen their innovation capabilities through dedicated evaluation tools.

Innovation auditing is an essential instrument for evaluating an organization's ability to generate and execute innovations, offering a definitive assessment of current competencies

and areas necessitating enhancement to foster innovative performance [12]. From this viewpoint, several authors and both national and international forums have formulated distinct approaches for evaluating innovation aptitude, aimed at offering a cohesive analytical framework. The Oslo Manual, the Romanian standard SR 13547-4, and the European Innovation Scoreboard are among the most prevalent methodologies, alongside various models proposed in the literature, which have thoroughly examined how organizations can assess and enhance this capability [13].

The Oslo Manual categorizes the variables pertinent to innovation into three main groups: the business environment (firms), research and development institutions, and technology transfer mechanisms. It advocates for a systematic evaluation encompassing an analysis of innovation expenditures, tangible outcomes (new products, processes, methods), and economic, social, or environmental impacts, considering both internal factors (resources, skills, infrastructure) and external factors (regulations, competition, collaborations) [13]. This method is especially pertinent in a scenario where the innovation process is affected by many obstacles that may impede the creation and execution of novel ideas and solutions. Specifically, SMEs in Romania and other rising nations encounter obstacles include limited access to financing, inadequate technical infrastructure, and a convoluted legislative environment [14].

The Oslo Manual offers a detailed framework for comprehending these impediments, categorizing them into two primary types: internal (concerning resources, skills, and organizational culture) and external (stemming from the economic, regulatory, and competitive landscape). The statement emphasizes the significance of strategic alliances with universities and research institutes, which may assist corporations in surmounting constraints and enhancing their innovation capacities [13].

For the purposes of this study, three related but distinct terms are clarified at the outset. "Innovation capability" is understood as the organizational competence to systematically

generate and implement innovations through structures, processes, and culture. “Innovation capacity” refers to the resources—human, financial, technological, and relational—that enable and support innovation capability. “Innovation potential” designates the latent opportunity for innovation that can be realized when capabilities and capacities are effectively aligned. In this paper, “innovation capability” is the central construct under investigation, while “capacity” and “potential” are used only in their complementary senses.

2. INNOVATION CAPABILITY ASSESSMENT METHODOLOGIES

2.1. Methodologies for evaluating innovation capability at the European level

The Oslo Manual is essential for standardizing and enhancing global innovation data, enabling uniform comparisons among countries and regions while aiding the understanding of innovation processes. Beyond its statistical function, it serves as a methodological reference for policymakers, researchers, and organizations seeking to measure and improve innovation performance. By establishing clear definitions, classifications, and measurement guidelines, it ensures that innovation indicators are both reliable and comparable across diverse economic and institutional contexts. Building on this standardized framework, the discussion can be expanded by considering strategic models that explain how innovation interacts with broader competitiveness factors.

Michael Porter, via his *Diamond Model*, elucidates the relationship between innovation and competitiveness, underscoring how innovation fosters competitive advantage through elements such as economic conditions, corporate strategy, and supporting industries. In this model, the interaction between factor conditions, demand conditions, related and supporting industries, and firm strategy is seen as a dynamic system that can accelerate or hinder innovation. Regions that nurture these interconnected elements are more likely to develop sustained competitive advantages in the global market. This theoretical alignment

highlights the complementary nature of innovation measurement frameworks and strategic competitiveness models, providing a holistic basis for policy and managerial action.

Collectively, these viewpoints demonstrate how the systematic utilization of innovation data and the implementation of innovative tactics may enhance the competitiveness of firms in the global marketplace [14, 15]. The integration of accurate, standardized data with strategic managerial decisions allows organizations to identify strengths, address weaknesses, and adapt more effectively to rapid technological and market changes.

To translate these theoretical considerations into practical benchmarking tools, the European Innovation Scoreboard offers a comparative platform for assessing national innovation performance across multiple dimensions. The assessment of the innovation capacity of European nations is the focus of the European Innovation Scoreboard (EIS), which utilizes a comprehensive set of indicators to present a thorough overview of the innovative potential of these countries. The EIS facilitates a detailed evaluation of performance across various dimensions of innovation, enabling comparisons not only between countries but also between different innovation dimensions within the same country. Figure 1 illustrates that Nordic nations, including Sweden and Finland, are designated as innovation leaders owing to substantial investments in research and development, well-developed digital and physical infrastructure, and strong public–private partnerships [17].

While leading nations demonstrate strong and balanced performance across all indicators, emerging innovators face structural constraints that limit their ability to fully capitalize on innovation potential. Conversely, Romania is classified as an emerging innovator, necessitating enhancements in public policies, increased access to financing, and more robust collaboration between academia, industry, and government [17]. This classification reflects structural challenges such as limited R&D expenditure, lower innovation output, and disparities in innovation performance across regions.

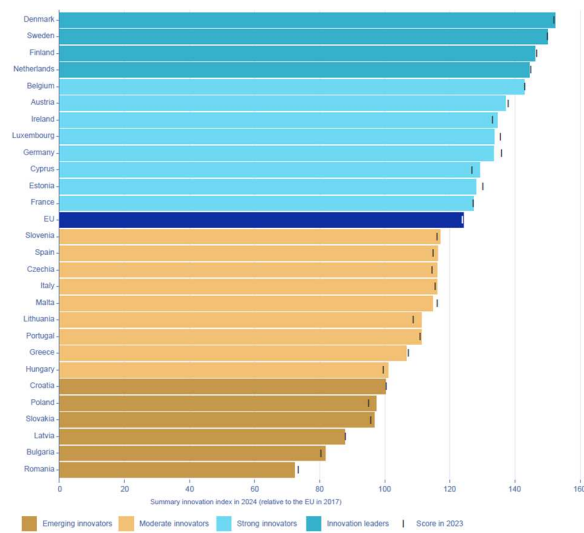


Fig. 1: The status of European nations regarding innovation [17].

The European Innovation Scoreboard for 2024 comprises 32 performance indicators, categorized into 12 innovation aspects and grouped into four primary categories: framework conditions, investments, innovation activities, and impacts. Each category captures a different dimension of innovation capacity, from the availability of human resources and research systems to business R&D expenditure, innovation collaboration, and the socioeconomic benefits resulting from innovative activities.

At the national level, these European comparisons take on specific relevance when examining the Romanian context in detail, revealing both strengths and areas for improvement.

2.2. Evaluation of National Innovation Capability

The study titled “Current situation of SME research in Romania” [14] underscores the extent of digital technology adoption among small and medium-sized firms within the framework of the National Innovation Capability Assessment. The study emphasizes the obstacles encountered by SMEs in adopting digital technologies and examines how elements such as innovation, competitive pressure, acquisition costs, perceived security, and technological support affect this process. [14]. The report highlighted the necessity for robust

public policies that promote collaboration between the public and private sectors, enhance investments in research and development, and mitigate administrative and financial obstacles for SMEs.

Research [17] indicates that in Romania, regional innovation capacity is markedly uneven, revealing economic and institutional disparities among regions. The Bucharest-Ilfov and North-West regions account for the majority of R&D investments and possess the most robust innovation ecosystems, supported by a high concentration of universities, research institutes, and innovative enterprises. Conversely, the remaining regions have markedly low levels of innovative activities, as seen by the scant number of innovative enterprises, patents, and public-private partnerships [18].

The concentration of human resources specialized in innovation is predominantly found in a limited number of major urban centers, thereby constraining the innovation potential in other areas. The more successful regions enjoy well-established collaborative networks among academia, industry, and local government, yet they still fall short of European benchmarks [18].

The disparities in innovation capacity are exacerbated by unequal access to finance, the limited digitalization of local governments, and the inadequate integration of SMEs into regional or European innovation networks. [17; 19]. Regional performance is uneven when viewed through the Regional Innovation Scoreboard (RIS 2025). In 2025, Bucharest-Ilfov (RO32) is just 59% of the EU-27 average, making it the sole Emerging+ area in Romania. All other regions are Emerging-. All eight areas did better between 2018 and 2025, with the Vest (RO42) region showing the most improvement. Also, every region did better again between 2023 and 2025. These numbers back up the idea that deficiencies at the national level are made worse by differences within the country, and that both horizontal and targeted, place-based interventions are needed.

Despite these differences, there are several remarkable success examples that show how Romanian businesses may get worldwide

prominence through innovative techniques. UiPath is a great example of innovation in the Bucharest-Ilfov area. It is a world leader in robotic process automation (RPA) and has changed the way repetitive tasks are done by combining RPA, AI, and machine learning solutions like the UiPath Studio platform and UiPath Academy. This has made things more efficient and taught users more [20; 21].

The North-West area's excellent infrastructure makes it easier for enterprises to come up with new ideas, especially in the IT field. Researchers have shown that business culture, spending on research and development, and working with other organizations are all important factors for innovation to be successful.

People in the North-West Region are always praised for their innovative technology projects, and TreMonti is a great example of success in this area. TreMonti stands out because it uses new technologies, such machine learning and artificial intelligence, to improve the business operations of its clients. The company prioritizes the development and implementation of tailored software to facilitate digitalization and innovation in enterprises. TreMonti Consulting was cited as an example of regional competence-building infrastructure [22].

Beyond regional and national assessments, it is equally important to examine how innovation capability is measured and developed at the level of individual organizations.

2.3 Assessment of Organizational Innovation Capability

Evaluating the innovation ability of firms requires the examination of various elements, including research and development (R&D) infrastructure, international partnerships, and governmental policy.

The Oslo Manual indicates that SMEs can gain significant benefits by collaborating with research institutes and engaging in public assistance initiatives [23]. Michael Porter asserts that innovation is a crucial component of economic competitiveness, and partnerships between the public and private sectors can enhance innovation ecosystems. [15] Simultaneously, Eric von Hippel contends that

end users can substantially contribute to the development of creative concepts, with SMEs possessing the potential to co-create tailored solutions [24]. Thus, various firms across sectors, have effectively incorporated technologies such as Big Data, AI, and IoT, using these breakthroughs to enhance operational efficiency, develop new products, and safeguard intellectual property.

The Romanian SR standard [25] delineates a methodology for evaluating the innovation capacity of organizations, encompassing organized processes, organizational culture, cooperation management, ongoing assessment, and the incorporation of innovation into organizational strategy. The standard underscores the need of assessing innovation management performance, concentrating on:

- Organizational culture: fostering and advancing innovation at every level.
- Resource management for innovation: optimal deployment of human and financial resources.
- Utilization of innovation outcomes: commercial and operational enhancement of innovations.
- Management of the innovation life cycle: ongoing surveillance and adjustment of innovative processes [25].

The innovation capacity of IT companies is a focus for certain researchers, who propose various models and strategies to enhance creativity and technological advancement. They emphasize critical factors influencing innovation success, including organizational culture, research and development investments, collaborations with universities and other institutions, and the adoption of emerging technologies [26]. Eric von Hippel, who authored works on open innovation and the involvement of users in the innovation process, underscores the significance of collaboration and the utilization of external resources to foster innovation in the IT sector [27].

2.4. Comparative Benchmarking Design and Indicative Results

To ground the recommendations in quantitative evidence, we conduct a light-touch

benchmarking using the European Innovation Scoreboard (EIS 2024) country profiles. Indicators are grouped into three bundles: (i) Capability (Innovators; Linkages), (ii) Capacity (Human resources; Digitalisation; Finance & support; Firm investments), and (iii) Outcomes (Intellectual assets; Employment impacts; Sales impacts). Scores reported by EIS are relative to the EU average (=100). We normalize them to a 0–1 scale by dividing by 100 and compute simple means for each bundle (“see Table 1”).

EIS 2024 Summary Innovation Index (SII) places Romania at 34% of the EU average, Bulgaria 46%, Poland 65.9%, and Hungary 70.5%, while Portugal stands at 83.5% (EU-27 = 100). These values are used as the Composite column below; detailed bundle drill-down is own for Romania (data availability is identical across countries and can be expanded in future work). Romania’s weakest link is firm-level capability (innovators, collaboration) and capacity inputs (human resources, finance, firm investment), while digitalisation is comparatively strong (92.8% of EU). Outcome indicators are mixed: relatively better sales impacts (62.3%) coexist with very low employment impacts (9.3%).

Peer composites confirm the performance gap with the EU average and highlight a relevant comparator set in Bulgaria, in Poland, in Hungary and in Portugal. Limitations results use secondary indicators and unweighted aggregation; they provide directional evidence. Future work can expand bundle reporting to all peers, adjust weights, and include RIS regional cuts. As a robustness check, we recomputed bundle scores using z-score normalization; the relative ordering and key gaps remained unchanged. In Table 1, bundle scores for Romania are means of EIS 2024-dimension scores normalized to 0–1, where C1-Capability, C2- Capacity, C3 – 2024-dimension.

3. MECHANISMS FOR DEVELOPING INNOVATION CAPABILITY

After looking at how to measure innovation capability at the organizational level, the conversation now turns to the real-world tools

and methods that businesses may use to improve this skill.

Table 1

Innovation Capability Profile for Romania vs. Peers (normalized)

Country /Region	(C1)	(C2)	(C3)	Composite (SII, 0-1)
EU-27 Average	1.000	1.000	1.000	1.000
Romania	0.048	0.386	0.356	0.340
Bulgaria	—	—	—	0.460
Hungary	—	—	—	0.705
Poland	—	—	—	0.659
Portugal	—	—	—	0.835

Organizations may use a variety of methods to encourage creativity, such as open innovation, which, as Chesbrough put it, lets them use outside resources, which cuts costs and speeds up the process of coming up with new ideas [28]. Openness brings forth a deep change that affects all part of innovation auditing [29]. Drucker emphasizes the need of a proactive strategy for incorporating innovation into all organizational activities. This is similar to an offensive strategy that involves spending a lot of money on research and development to enter new markets and create new goods [30]. On the other hand, the defensive approach, which is based on prudence, focuses on lowering costs and improving current goods while keeping an eye on new technologies to stay competitive without taking on too many risks.

In addition to these broad strategic directions, companies may also utilize more customer-focused innovation methods that get end users directly involved in the process of making things. So, more research shows that innovation strategies that focus on working with customers to create new things—like the reactive approach that risk-averse companies use, the passive strategy that waits for clear customer demand, or the interstitial strategy that tries to avoid direct competition, can make customers more than 25% happier [29].

These strategic choices are typically put into action through certain creative methods and organized instruments for solving problems. Some common methods are brainstorming [31], the SCAMPER approach [32], TRIZ [33], and Design Thinking [34].

Brainstorming, created by Alex Osborn, is a group idea-generating process that encourages everyone to come up with ideas without judging them, which is good for creativity [31]. Altshuller, the originator of TRIZ, advocates a systematic methodology for problem-solving, particularly beneficial for SMEs with constrained resources [33]. Conversely, Design Thinking integrates user empathy with quick prototyping, enabling organizations to create effective and scalable solutions [34]. Furthermore, implementing SWOT analysis at the innovation strategy level enables organizations to discern vulnerabilities and use market possibilities [35]. While internal tools and methods are essential, external support mechanisms—particularly those provided through public funding programs—can significantly amplify an organization's innovation capacity.

Public programs are essential for assisting SMEs in the innovation process. Horizon 2020, a prominent European initiative, has financed various projects targeting SMEs, with an emphasis on digitalization and sustainability [4]. In Romania, efforts like the Inobarometer and European R&D grants have bolstered creative SME projects, including those by Bitdefender in cybersecurity. Additional initiatives, including the Digital Europe Program, enhance the digitalization of SMEs by facilitating access to developing technology [36].

European SME programs have positively influenced competitiveness, innovation, and economic growth; nevertheless, the effects are unevenly distributed among regions and sectors. Assessments by the European Commission, Horizon 2020, the European Court of Auditors, and annual reports on SMEs underscore the advantages and obstacles associated with the effective execution of European funds and programs. Several initiatives across Europe demonstrate how targeted support can catalyze innovation ecosystems and foster new business models. Notable examples of effective practice encompass the "French Tech" project, which fostered the advancement of new platforms like BlaBlaCar, and the SME Digital Innovation

Hubs, which enabled SMEs to access digital networks.

Ultimately, the success of these programs and tools depends on leadership commitment and an enabling policy environment. Drucker contends that organizational leaders must foster a culture of adaptability conducive to innovation [30]. Additional studies highlight that SMEs investing in employee training in digital competencies possess a greater likelihood of achieving success in the innovation process [37]. Government regulations and incentives for research and development can assist companies in surmounting these challenges and fostering a climate receptive to innovation.

4. CONCLUSIONS

This paper provides a literature-based synthesis of established frameworks for assessing innovation capability in SMEs (Oslo Manual, EIS, SR 13547-4) and translates them into actionable managerial and policy guidance. A light-touch benchmarking using the European Innovation Scoreboard 2024/2025 anchors these insights quantitatively: Romania's composite performance stands at 0.34 of the EU average in 2024 and 0.377 in 2025 (EU=1), with comparatively strong digitalisation but persistent gaps in firm-level capability (innovators, linkages) and capacity inputs (human resources, finance, firm investment). At the regional level, RIS 2025 shows Bucharest–Ilfov at 59% of the EU average (Emerging+), while all other regions remain Emerging-, confirming that national performance is driven by a narrow set of regional strengths and substantial intra-national disparities.

Against this evidence, we prioritise five actions that directly map to the observed gaps: (1) professionalise innovation capability at firm level through structured auditing (SR 13547-4) and disciplined process ownership; (2) expand human-capital pipelines (tertiary attainment, STEM upskilling) and co-fund business R&D in supply-chain consortia; (3) convert strong digital adoption into outcomes by scaling data/AI use-cases tied to product and process innovation; (4) deploy place-based instruments

that replicate the Bucharest–Ilfov playbook in second-tier regions (university–industry linkages, cluster governance, mission-oriented calls); and (5) institutionalise outcome tracking (patents, knowledge-intensive employment, innovation-driven sales) at both national and regional levels. Future work should (i) extend the benchmarking with weighted bundles and sector cuts, and (ii) integrate firm-level microdata to test causality between capability investments and outcome trajectories.

The audit findings underscore the importance of integrating the seven key elements outlined in the SR 13547-4 standard, strategy, leadership, processes, outcomes, customer orientation, resource management, and lifecycle management, into a coherent innovation management system. Current weaknesses, such as the intermittent nature of innovation projects, the absence of formalized processes, and the lack of systematic outcome monitoring, hinder the transition from potential to measurable performance gains.

Against this quantitative backdrop, the following actions are prioritized to convert existing digital strengths into measurable outcomes while closing persistent capability and capacity gaps. To bridge these gaps, SMEs should:

1. Establish a clear innovation strategy aligned with both market demands and sustainability objectives.
2. Formalize internal innovation processes, ensuring continuity and accountability.
3. Invest in digital transformation as a lever for operational efficiency and market expansion.
4. Strengthen partnerships with universities, research centers, and industry clusters to access knowledge, technology, and networks.
5. Integrate end-user feedback into product and process design to enhance relevance and adoption rates.

These actions can convert latent innovative potential into sustained competitive advantage, while also contributing to broader sustainable development goals. By embedding innovation in organizational culture, aligning resources with strategic priorities, and maintaining strong external linkages, SMEs can not only overcome

structural limitations but also position themselves as active contributors to a more innovation-driven and sustainable economy, objectives.

5. REFERENCES

- [1]Trantow, S., Hees, F., Jeschke, S., *Innovative capability—An introduction to this volume*. In: Enabling Innovation: Innovative Capability-German and International Views. Berlin, Heidelberg: Springer Berlin Heidelberg, p. 1-13, 2011.
- [2]Śledzik, K. *Schumpeter's view on innovation and entrepreneurship*. Management Trends in Theory and Practice, (ed.) Stefan Hittmar, Faculty of Management Science and Informatics, University of Zilina & Institute of Management by University of Zilina, 2013.
- [3]European Commission, *Profile, Country*. – *European Innovation Scoreboard 2024: Country profile*, available at: https://ec.europa.eu/assets/rtd/eis/2024/ec_rt_d_eis-country-profile-el.pdf. Accessed: July 1, 2025.
- [4]European Commission, *Horizon 2020 Reports*, available at: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en. Accessed: May 16, 2025.
- [5]Chesbrough, H., Vanhaverbeke, W., West, J (ed.). *Open innovation: Researching a new paradigm*. Oxford university press, 2006.
- [6]European Court of Auditors, Special Report 08/2022: ERDF support for SME competitiveness, available at: https://www.eca.europa.eu/en/publications/SR22_08. Accessed: June 12, 2025.
- [7]Government of Romania, *National Strategy for Research, Innovation and Smart Specialisation 2022–2027*, available at: <https://uefiscdi.gov.ro/resource-867892-SNCISIenglish-version.pdf>. Accessed: June 25, 2025.
- [8]Chatterjee, S., et al. *The consequences of innovation failure: An innovation*

- capabilities and dynamic capabilities perspective*. Technovation, 128:10285, 2023.
- [9] Drucker, P.F., et al. *The discipline of innovation*. Harvard business review, 80.8, pp. 95-102, 2002.
- [10] Christensen, C.M., et al. *Disruptive innovation: An intellectual history and directions for future research*. Journal of management studies, 55.7, pp. 1043-1078, 2018.
- [11] United Nations Conference on Trade and Development, *World Investment Report 2023: Investing in sustainable energy for all*, available at: https://unctad.org/system/files/official-document/wir2023_en.pdf. Accessed: June 19, 2025.
- [12] Vlăduț, G, et al. *Innovation audit for business excellence*. In: Proceedings of the international conference on business excellence, pp. 1026-1037, 2018.
- [13] Eurostat. *The Measurement of Scientific, Technological and Innovation Activities Oslo Manual 2018 Guidelines for Collecting, Reporting and Using Data on Innovation: Guidelines for Collecting, Reporting and Using Data on Innovation*. OECD publishing, 2018.
- [14] European Commission, *Current situation of SME research in Romania*, available at: https://single-market-economy.ec.europa.eu/smes/sme-strategy-and-sme-friendly-business-conditions/sme-performance-review_en. Accessed: June 14, 2025.
- [15] Stonehouse, G., Snowdon, B., *Competitive Advantage Revisited: Michael Porter on Strategy and Competitiveness*, Journal of Management Inquiry, vol. 16, no. 3, pp. 256-273, 2007.
- [16] Duan, S., et al., *Investigation of the Development of a Regional Innovation Capability Evaluation Framework: Analyzing Indicators in Hangzhou and Ningbo*, Technology Analysis & Strategic Management, vol. 29, no. 1, pp. 84-102, 2017.
- [17] European Commission, *European Innovation Scoreboard 2024*, Available: https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en. Accessed: July 15, 2025.
- [18] European Commission, *Regional Innovation Scoreboard 2025*. Available: https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/regional-innovation-scoreboard_en. Accessed: Aug. 12, 2025.
- [19] European Commission, *Romania in the Digital Economy and Society Index (DESI)*, Available: <https://digital-strategy.ec.europa.eu/en/policies/desi-romania>. Accessed: Aug. 2, 2025.
- [20] Wall-Street.ro, *Cum a ajuns UiPath cel mai mare startup de inteligență artificială din lume*, Wall-Street.ro, May 6, 2019. Available: <https://www.wall-street.ro/articol/Start-Up/240742/uipath-cel-mai-mare-startup-de-inteligenta-artificiala-din-lume.html>. Accessed: Jul. 18, 2025.
- [21] UiPath, *Blog*, Available: <https://www.uipath.com/blog>. Accessed: Jul. 9, 2025.
- [22] PitchBook, *TreMonti Consulting company profile*, PitchBook. Available: <https://pitchbook.com/profiles/company/251489-80#funding>. Accessed: Jul. 21, 2025.
- [23] OECD/Eurostat, *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd ed.*, Paris: OECD Publishing, 2005. Available at: https://www.oecd.org/en/publications/oslo-manual_9789264013100-en.html. Accessed: July 14, 2024.
- [24] von Hippel, E., *The Sources of Innovation*, in *Das Summa Summarum des Management: Die 25 wichtigsten Werke für Strategie, Führung und Veränderung*, Wiesbaden: Gabler, pp. 111-120, 1988.
- [25] SR 13547-4:2012 – *Model de dezvoltare a afacerii prin inovare. Partea 4: Evaluarea capabilității de inovare și a performanței managementului inovării*, Standard Român, ASRO, 2012.
- [26] Edison, H., Bin Ali, N., Torkar, R., *Towards innovation measurement in the software industry*, J. Syst. Softw., vol. 86, no. 5, pp. 1390-1407, 2013.
- [27] von Hippel, E., *Democratizing innovation: The evolving phenomenon of*

- user innovation, J. für Betriebswirtschaft*, vol. 55, no. 1, pp. 63-78, 2005.
- [28] Chesbrough, H., *From open science to open innovation*. Institute for Innovation and Knowledge Management, ESADE, 2015.
- [29] Frishammar, J., Richtnér, A., Brattström, A., Magnusson, M., Björk, J., *Opportunities and challenges in the new innovation landscape: Implications for innovation auditing and innovation management*, European Management Journal, vol. 37, no. 2, pp. 151-164, 2019.
- [30] Drucker, P.F., *The discipline of innovation*, Harvard Business Review, vol. 80, no. 8, pp. 95-102, 2002.
- [31] Gregersen, H., *Better brainstorming*. Harvard Business Review, 96(2), pp. 64-71, 2018.
- [32] Elmansy, R., *A Guide to the SCAMPER Technique for Design Thinking*, Designorate, Oct. 4, 2015. Available: <https://www.designorate.com/a-guide-to-the-scamper-technique-for-creative-thinking/>. Accessed: Jul. 15, 2025.
- [33] Livotov, P., Petrov, V., *TRIZ Innovation Technology: Product Development and Inventive Problem Solving. Handbook*, 1st ed., ISSN 1866-4180, Jan. 2023.
- [34] Bender-Salazar, R., *Design thinking as an effective method for problem-setting and needfinding for entrepreneurial teams addressing wicked problems*, Journal of Innovation and Entrepreneurship, vol. 12, no. 1, p. 24, 2023.
- [35] Silitonga, R.Y. Rizky, B., *Proposed SWOT Strategy with Attention to the Managerial Innovation Level*, Journal of Novel Engineering Science and Technology, vol. 1, no. 01, pp. 1-8, 2022.
- [36] European Commission, *Digital Europe Programme, Shaping Europe's Digital Future*. Available: <https://digital-strategy.ec.europa.eu/en/activities/digital-programme>. Accessed: Jul. 18, 2025.
- [37] Cybernews, *I've Tested Bitdefender Antivirus: My Full Review for 2025*, Cybernews, updated Apr. 10, 2025. Available: <https://cybernews.com/best-antivirus-software/bitdefender-antivirus-review/>. Accessed: Jul. 17, 2025.

Evaluarea modelelor de analiză a capacității de inovare în IMM-uri: implicații strategice și de sustenabilitate

Acest studiu oferă o sinteză bazată pe literatura de specialitate a cadrului consacrat pentru măsurarea și orientarea capacității de inovare în întreprinderile mici și mijlocii (IMM-uri) — incluzând Manualul de la Oslo, European Innovation Scoreboard și SR 13547-4. Pe baza acestor referințe, extragem metode practice (precum auditul inovării, inovația deschisă, metoda design thinking/TRIZ și valorificarea programelor publice de finanțare) și le corelăm cu obiectivele de sustenabilitate. O analiză comparativă de tip benchmarking simplificată, utilizând EIS 2024, poziționează România la 0,34 din media UE (UE = 1), cu o digitalizare relativ puternică, dar cu deficit persistent în ceea ce privește rezultatul procesului de inovare și capacitatea de inovare la nivel de organizație. Transpunem aceste constatări cantitative și calitative în recomandări prioritizate și aplicabile, adresate managerilor și factorilor de decizie în domeniul politicilor publice.

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